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An investigation into the relationship between PVA NWBA wheelchair basketball skills test and evaluative observations

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AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN PVA/NWBA WHEELCHAIR BASKETBALL SKILLS TEST AND EVALUATIVE OBSERVATIONS

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THESIS ACCEPTANCE

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ABSTRACT

The purpose of the study is to investigate the Paralyzed Veterans of America (PVA) National Wheelchair Basketball Association (NWBA) Wheelchair Basketball Skills Test. The purpose was to determine a comparable relationship between the PVA/NWBA Wheelchair Basketball Skills Test and the skill level judgment of the experts and novices ranking. The study examined the wheelchair basketball skills of 90 athletes who attended the PVA/NWBA National Basketball Camp in Springfield, Massachusetts in 1997. Of the 90 participants, 24 athletes (n=24) were observed by and ranked on a scale of high, average or low for their overall ability in the sport of wheelchair basketball. These rankings were compared to the rankings that each individual earned taking the PVA/NWBA Wheelchair Basketball Skills Test. The three: skills test, experts, and novice, rankings were then compared to the data. The results of the study indicated the experts agreed 70.8% of the time with the PVA/NWBA skills test and the novices agreed with the test 73.9%. Reliability coefficients were determined as .7427. The win/loss standings of the individual teams also were recorded and indicated that using the PVA/NWBA skills test to divide the athletes into equally competitive teams was an effective tool.

From the results of the study the following conclusions were made: 1) the PVA/NWBA skills test was an adequate assessment to administer as an instrument describing basketball proficiencies of basketball athletes; 2) it was confirmed successful in evenly distributing the abilities of the athletes into equally competitive teams.

DEDICATION

This work is dedicated to my family and friends who believed in me, offered support and encouragement throughout my academic career. With fears of failure haunting me with every new challenge, I was embraced with the message of determination, hard work, and reminders that I am never alone, to head me back down the trail of success. I also developed my own definition of what success means to me. Success is: enjoy what you do, embrace your dreams, challenge yourself, continue to learn, and give of yourself along the way. I have learned hard lessons of life by the example of my parents and loved ones and now standing before you is a strong, determined woman ready to give back to society what I have so richly gained.

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I would also like to recognize the administrators, staff, coaches, and participants that were part of the PVA/NWBA National Wheelchair Basketball Camp held in 1997.

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CHAPER I
THE PROBLEM

Introduction

The relationship of the scores acquired from the National Wheelchair Basketball Association (NWBA) Paralyzed Veterans of America (PVA) Wheelchair Basketball Skills Test with the rankings of the experts and novices appears to be a subject worthy of consideration for research. Many coaches are already using the skills test as an informational tool to assist in instructional teaching and dividing athletes up into equally competitive teams. Although the skills test is being used, it still needs to be researched to provide further backing to the test itself. This test instrument was first developed in 1984 (Brasile). The PVA/NWBA Wheelchair Basketball Skills Test has been reported to be a statistically reliable tool by coaches that use the test battery. It has been used by many coaches around the world to evaluate the skill levels of wheelchair basketball athletes. This test has also been used every year at the national wheelchair basketball camp sponsored by Paralyzed Veterans of America (PVA) as an opening day evaluation of the players skills. The data acquired are then used to place the athletes on equally competitive teams based on their accumulative skills test T-score results.

In 1986, Brasile and Hedrick updated the original skills test (Brasile 1994). The revised version has been used over the past twelve years to evaluate the entry level skills of wheelchair basketball participants at the annual NWBA/PVA National Wheelchair Basketball Camp. Yet, questions concerning the test's overall validity to judge skill levels of the participants need to be answered from purely an observational viewpoint. Comparing the skills test to a purely observational viewpoint was designed after the

formate of the Rowe 1994 study which supported field performance of elite basketball players as assessed by the Comprehensive Basketball Grading System was related to scouting results of the game. More specifically, will the instrument results stand up as a valid judge of the playing skills levels of basketball participants when compared to the judgments of expert and non-expert observers? Therefore, the purpose of the study was to examine the relationship between the NWBA/PVA Wheelchair Basketball Skills Test and an observable ranking instrument utilized by two groups, expert and non-expert observers.

As such, this study attempts to add additional validity to the quality of the NWBA/PVA skills test, which is presently being used to evaluate wheelchair basketball athletes' skill levels.

Skills Testing In General

Learning, developing, and retaining specific skills comprise the essence and foundation of physical education and sport. Accordingly, skill acquisition and development in specific sports constitutes a major emphasis for all programs. Skills tests, in effect, reflect ability of individuals to participate in specific sport activities. The primary purpose of skills tests is to measure progress or level of achievement.

The Athletic Badge Tests (1913) have been recognized as the first sports skills tests ever devised. They were developed by the Playground and Recreation Association of America and included individual items from baseball, basketball, tennis, and volleyball. Skills test construction accelerated with the development and increase in physical education curricula in schools during the 1920's, an era when great emphasis was placed upon athletics and physical education in this country.

Greater sophistication was realized in skills tests construction in the 1930's with the advent of tests developed by scientific procedures. Recognizing the need to standardize skills tests on a national level prompted the Research Council of the American Association for Health, Physical Education and Recreation to initiate a Sports Skills Test Project in 1959. Out of this project came manuals for skills tests in football (1965), basketball, and softball (1966), archery (1967), and volleyball (1969).

Most skills tests claim to have face validity. According to Collins & Hodges (1978) an example of this kind of validity is when a test component is the same as the particular skill required within a certain sport. Evaluating individual achievement in skills tests is usually accomplished by matching an individuals' score with established norms. The two commonly used normative scales in standardization of sports skills tests are T-scales and the percentile scales.

Skills testing does not attempt to predict the results of a performance level of an athlete in the heat of competition. As such, most skills tests do not collect data related to the ability of the individual to perform during competition. In most instances the competition brings out the best or the worst in the individual. Yet, the challenge of the test in and of itself does induce performance anxiety, especially if the test battery is going to be used for judgment for placement on a team. Skills testing can also be valuable for purposes of grouping and training.

Skills Testing in Wheelchair Basketball

Since the summer of 1986, wheelchair basketball participants who have attended the National Wheelchair Basketball Association (NWBA)/Paralyzed Veterans of America (PVA) summer basketball camps, have been introduced to the skills test upon arrival at

camp. Scores acquired from these tests have been used to place participants in groups for instructional and participatory purposes while at camp. This particular skills test was developed as a result of previous research related to wheelchair basketball skills testing (Brasile, 1984) and revised in 1986 (Brasile & Hedrick).

The first wheelchair basketball skills test consisted of the following seven items: 20 meter sprint, obstacle dribble, speed pass, pass for accuracy, baskets per minute, rebounding, and free throws (Brasile, 1984). Also included were directions for administration and T-score scale information for coaches who would use this test to better understand levels at which their athletes were participating. The following year another wheelchair basketball skills test was developed to obtain information from the 1986 USA Gold Cup Mens' Team. This test introduced the concept of acquiring information regarding the athletes' ability to use dominant and non-dominant hands in participation (Brasile, 1986a).

Development of the wheelchair basketball skills test currently used at NWBA/PVA Wheelchair Basketball camps began with an evaluation of the test published in Sports 'N Spokes (Brasile, 1984) along with a similar evaluation of the test used in with the 1986 Gold Cup team. In particular the 20 meter sprint, obstacle dribble, baskets per minute, and pass for accuracy are currently used as part of this new test battery. Added to this new instrument were items used for measuring skills related to using dominant and non-dominant hands. Also added to this test battery was the spot shot.

The non-dominant tests and spot shot were added after members of the coaching staff expressed a desire to obtain results that would better indicate shooting skills from

different areas on the floor. The coaches also wanted results that would indicate the potential of each participant in using both sides of the body in performing the skills. All participants, regardless of disability level, are required to perform each skill test identically.

Wheelchair basketball is unique when compared to stand up basketball because at each competition a player is placed into a classification level based upon his/her disability in order to "ensure fair and equitable competition". Classifying athletes for competition in wheelchair basketball has been equated to weight classes for competition in wrestling or handicapping in golf which are also done for fair and equitable competition. However, classification of athletes based solely on level of disability is unique to sports for the disabled.

Wheelchair Basketball Classification

In a publication related to classification and sport for disabled athletes who participate in international competitions that was produced by the Barcelona '92 Olympic Organizing Committee (COOB '92), classification of disabled athletes was described as follows:

"In all competitions specifically for disabled athletes, medical classifications constituted a leveling factor between physical capacity and competition. Years of hard work have gone into the development of classification systems which ensure that disabled athletes of the same class compete as fair as possible in conditions of equality, and this has caused a diminishment in that other important aspects of sports for the disabled, competition." (COOB, 1992, p. 3)

Guttmann (1976) described the aim of classification in wheelchair sports to, "ensure fair play and to eliminate as far as possible injustices between participants in the same class and to give priority to the more severely disabled." (p35)

According to the International Stoke Mandeville Games Federation (ISMGF) wheelchair basketball classification committee; "An efficient classification system is a pre-requisite of the establishment of fair and equitable competition (COOB, 1992)." As such, they believe they have developed a system that does not focus on the skill or level of training of a player but focuses on what they call the measure functional limitations caused by the physical disability. They believe that, "The disability understandably affects the player's capacity of performing the different skills of wheelchair basketball such as pushing (wheeling) the chair, catching and throwing the ball, shooting, and dribbling."

Of most importance in this system is the level of trunk function. As such, under the system, "the level of sitting balance and trunk movement of the players become the fundamental elements used in the definition of classes and in the development of a testing procedure fair to all. (COOB, 1992)"

In the USA the classification system is predicated upon a medically oriented model or injury level or involvement, a Class I athlete being the more severely disabled participant (T-7 or above), the Class II athlete being moderately disabled (T-7 through L-2), and the Class III participant being the least disabled (L-2 or below). Each athlete holds a point value which is reflective of their classification, such as a Class II athlete would be worth two points. At no time in a game is a team to have players participating with a total of points valuing greater than 12, nor more than three Class III players

playing together at the same time. The rationale for this system has not been tested for its validity in a medically oriented study since its inception.

Internationally, wheelchair participants are placed into one of 8 classification levels for participation. The International Wheelchair Basketball Federation (IWBF) uses a points system that is similar to USA's medical system. Additionally, it has also introduced half point values "to make the new system more flexible, especially with regard to borderline cases." Each classification is also given a numerical value. Similar to that of the USA system, functional potential is represented by paraplegics with complete lesions originating at the levels listed next to the class. Class I equals 1 and 1.5 points (T-7 and above), Class II equals 2 and 2.5 points (T-8 to L-5), Class III equals 3 and 3.5 points (L-2 to L-4), Class IV equals 4 and 4.5 points (L-5). In the international competition each team is allowed to field a team with no more than thirteen and a half points to be on the court at one time. These rules are set up by the NWBA Rules and Regulations (1984).

There is a inherent assumption in wheelchair basketball based upon classification of athletes in relation to their disability level, that is, the lower the class the less skilled the athlete. In other words those with more severe disabilities will most likely not be able to perform at the high skill level as those with less severe disabilities. Over the past twelve years skill tests have been used in an attempt to better understand this assumption.

Research Related to Wheelchair Basketball Skills Testing

Brasile (1986b, 1990) used skills tests results in an attempt to better comprehend the relationship between disability levels, as specified by NWBA classification levels, and participant skill levels. Both of these investigations indicated that Class II and Class

III athletes appeared to be close in skill level, and that Class I participants appeared to have lower skill level than Class II and Class III.

In 1987, Vanlerberghe & Slock developed a wheelchair basketball skills test to study relationships between wheelchair basketball skills, disability levels and perceived skill levels. The authors reported that a T-score of the skills test should be developed to demonstrate individual skill levels. Lack of a significant number of participants prevented them from completing this task.

Kebele (1989) used the test described in Brasile (1986a) in an attempt to study level of skill of the Czechoslovakian national team members compared to skill levels of USA team participants. This study revealed lower levels of skill among the Czechoslovakian players in all areas.

Brasile (1990) used results acquired from the NWBA/PVA Skills Test in a study to identify factors other than disability level that influence performance. These factors included: hours of practice per week, previous experience in wheelchair basketball, previous experience in basketball prior to injury, and age.

In 1993, Brasile evaluated the skill levels of the 1992 USA Women's Paralympic Silver Medal Team with those of the 1986 USA Men's Gold Cup Champions. Results indicated that women in the USA have developed to a level equal to their elite male counterparts in relationship to overall skills needed to participate in the sport. Women scored better in the skill areas that require agility and fine motor discipline, and men appeared to do better in the areas that require strength. More recently, Vanlandewijck, Spaepen & Lysens (1995) and Brasile & Hedrick (1996) investigated the relationship of wheelchair basketball skills to the current international wheelchair basketball functional

classification system. Hedrick and Brasile uncovered a relationship between the elite skill performance and international class level of athletes. Class I skill levels are weaker than class II and III, but class II and III are comparably equivalent in skill level. Vanlandewijck, Spaepen, and Lysens conducted an investigation that discovered a relationship between the level of physical impairment and wheelchair baskeball performance. They also recommended that classes II and III be combined to form one class in the classification system. These research studies conclude that class II and III be combined to better the competitive component of the game and to have less modifications compared to the standup game.

It is apparent that skills testing is a valuable tool used to evaluate a wheelchair basketball participant related to her/his skill level. However, the question that remains to be answered is how valid are these tests when compared to pure observation. Rowe (1994) concluded that Comprehensive Basketball Grading System (CBGS) parameters were a valid predictor for individual field performance of a non-disabled basketball player and that the field performance of elite basketball players as assessed by the CBGS was related to scouting results. Furthermore, scouting results had high predictive validity toward the final result of the game. Will similar results occur when using a similar validity design for the wheelchair basketball skills test?

Research Question

Are results acquired from the PVA/NWBA Wheelchair Basketball Skills Test comparable to the skill level ranking of the panel of observers? In other words, do the reported skill levels of participants, as indicated by scores on a wheelchair basketball

skills test, compare favorably to those of the skills rankings of the novice and expert rankings?

Hypothesis

There will be a comparable relationship between the PVA/NWBA Wheelchair Basketball Skills Test results and the skill level judgment of the experts and novices rankings.

Delimitations

The scope of this study included participants of the 1997 National Wheelchair Basketball Camp held in July in Springfield, Massachusetts. The athletes participated in the skills test during the first day of camp and then were observed and skill level evaluated while actively participating in a scrimmage game of basketball during the first two evenings of camp. Each subject was assessed for overall skill level on a scale of high, average and low. The subjects were assessed during the first two evenings of camp by seven expert coaching staff and a group of twelve novices who were students on campus during the academic summer session.

Definition of Terms

1. Elite- Wheelchair basketball athletes that posses a high degree of skill level.
2. Expert Ranker- Individuals who have a minimum of two years coaching experience on the national level.
3. Functional Classification- The classification system that is presently being used to put athletes into a class. The class represents their level of physical injury.
4. Novice Ranker- All the students (non-experts) who have a general knowledge of basketball

5. Skill Levels- Based upon T-scores on the PVA/NWBA wheelchair basketball skills test
    A. High Skill Level- a T-score of 371.56 and higher or the top 25% of the athletes from the test administered at the 1997 camp
    B. Average Skill Level- a T-score between 371.55 - 333.1 or the middle 50% of the athletes from the test administered at the 1997 camp
    C. Low Skill Level- a T-score of 333.11 and below or the lower 25% of the athletes from the test administered at the 1997 camp
6. Wheelchair Basketball- A team oriented activity that allows athletes with varying degrees and levels of disabilities to participate in an inclusive atmosphere based on a player classification system of wheelchair basketball (Brasile and Hedrick, 1996).

CHAPTER II
METHODS & PROCEDURES

The study methods and procedures which were used are described below. They include a description of the sample, the development of the ranking instrument used, a description of a ranking procedure, and a discussion of the techniques used for the data analysis.

Subjects

Individuals who participated in the 1997 NWBA/PVA Wheelchair Basketball Camp hosted by Springfield College in Springfield, Massachusetts were the subjects of this study. They represented national and international residents and ranged from ages 16-59 years old. All potential subjects were informed of the study and asked for their verbal consent for participation. Ninety athletes took part in the PVA/NWBA skills test that was administered the first day of the National Wheelchair Basketball Camp. For the actual study, 24 athletes were chosen from the group of 90 athletes.

Instrumentation

The evaluation form used was a recording instrument created by the researcher based upon past research in this area. As indicated in Vanlandewijck, Speapen, and Lysens (1995), "the game of basketball involves many strategies both offensive and defensive, that must be performed well by individuals for the team to be successful" (p. 141). This is what these authors describe as "field performance". The skills test used for this study can be described as an instrument that looks at some of the components necessary for successful offensive participation in wheelchair basketball, or in other words, as an instrument that may judge global skill levels. Byrnes (1989) developed a

tool to rank athletes based upon qualities of game performance. This instrument, the Comprehensive Basketball Grading System (CBGS), was then used be Rowe (1994) when comparing scouting results of competition in basketball with those of expert judgment of each player and he concluded that "the field performance of elite basketball players assessed by CBGS was related to the scouting results. The instrument used for this study is similar to the one used by Rowe (1994) and was selected because of the ease of transferring over the results of the expert observers to those of the total T-test scores of the participants. This is thus a more global view of skills in general.

A global view of skill level means the athletes were judged on observational scouting results rather than individual elements of skill performances, ranking athletes on skill level based on speed, dribbling, shots, etc.. The skills test itself was designed with a global field performance in mind. The skills test is an accumulation of seven skills results combined into one total T-score which provides the overall, global skill level of the athletes. The evaluation form used in this study consisted of three categories of perceived skill rankings of high, average, and low, the name of the team, and jersey number of the athlete to be identified on that team. The individuals completing the form were given these directions:

> Your documented ranking will represent the athletes overall skill and ability level in wheelchair basketball. Please rank each individual on this form by marking one of the three skill level categories as you first observe the athletes during the scrimmage sessions. You are asked not to interact with other individuals who are acting as observers for this study. If you

have any questions during this evaluation, please ask the researcher at any time.

Ranking Procedures

The evaluation form was developed to have the two groups of evaluators record observed rankings on the study subjects. The evaluators were observing the athletes under a team and competitive environment. The evaluators were asked to observe the subjects in a scrimmage situation and than rank them in one of the three categories provided. There were 24 subjects selected from the 90 participants in the national wheelchair basketball camp. These subjects were divided into high, average, and low skill level categories based on the results of the skills test that everyone participated in. Upon completion of the skills test, results were tabulated and converted into standardized T-scores for each individual on each test. These individual T-scores were then added together to create a Total T-score for the test.

Next, eight equally competitive teams were developed from the pool of 90 athletes. For the purpose of the study, subjects were then randomly selected from the teams by using a blocking method. The blocking method is a sampling procedure used by placing the athletes score cards in the order of the T-scores. The score cards are then separated into eight individual piles representing the eight teams. The researcher starts the piles on one end going from left to right. When beginning the eight team pile, the researcher will place two score cards on that pile and continue to place the athletes score cards going from right to left. This procedure is continued until all of the score cards have been placed. Teams were then randomly given names (i.e. Comets, Starz, Mercury, Rockers, Sparks, Liberty, Monarchs, Sting).

From the Rockers, Mercury, and Liberty there was one athlete from each team randomly chosen to represent each of the high, average, and low categories for a total of nine subjects from these teams. The Comets had two athletes from the low category and one individual from the high skill level. The Sparks had two athletes from the high category and one athlete from the low ranking. Additionally, the Monarchs team was represented by three men in the high skill level, the Sting team had three people in the middle skill level, and there were three athletes in the low category from the Starz team.

A copy of the evaluations forms that were filled out can be found in Appendix B. Coaching experts and student novices were the evaluators and filled out the ranking forms. The final group of subjects used in this study represented three athletes randomly selected from each team. The data created by the experts and novices were collected and compared to the skill level of the results from the NWBA/PVA Wheelchair Basketball Skills Test .

Data Analysis

The statistics that were utilized in this study were descriptive statistics, standardized scoring, rankings, and percentages. The NWBA/PVA Wheelchair Basketball Skills Test is based on the T-score of each individual athlete.

The coding and analysis of data were done using the Statistical Package for Social Sciences (SPSS), on the University of Nebraska at Omaha's (UNO) Academic System. Reliability analysis (Hull and Nie, 1981) was accomplished by using the SPSS-X reliability option.

Summary

The content in this chapter illustrates the methods and procedures that were utilized in the investigation. Twenty-four subjects, seven experts, and twelve novices were the people that made this study feasible. The instrumentation, ranking procedures, study variables and data analysis explain the procedures in which the data was collected, categorized and examined. The next step is to explain how the data collection really speaks to the purpose of the study.

CHAPER III

RESULTS

This section includes the results of the analysis of the ranking completed by two groups, novices and experts at the PVA/NWBA National Wheelchair Basketball Camp and data from the PVA/NWBA wheelchair basketball skills test. The characteristics of the samples used for this study, and analysis of the responses of the items of the observed evaluations are covered in relation to the PVA/NWBA Skills Test T-scores, as well as a correlation analysis.

Respondent Characteristics

The 90 athletes who attended the National Wheelchair Basketball ranged an age from 16-59 years, with a mean age of 30 years. The mean of hours of practice per week, the athletes themselves reported, was 6.79. The mean of age of onset for injury reported was 17.89. The mean of years of experience in playing wheelchair basketball reported was 4.69. The mean of years playing stand-up basketball before the athletes disabling injury was 3.33

The character data for the 24 athletes used in this investigation was comparable to the total sample. The mean age of the athletes in this study group was 29.71. Their mean hours of practice per week was 7.2. Their mean of age of onset for injury was 15.79. The mean of years of experience in playing wheelchair basketball for the study group was 5.13, and the mean of years playing stand-up basketball before the athletes disabling injury was 2.75. A representation of these comparisons can be found on Table I.

The twenty-four athletes randomly picked was a good representation of the wheelchair basketball athletic population because the mean scores where comparably

similar. The sample group was very similar in age, slightly higher in time spent practicing wheelchair basketball, and a bit lower mean score for the age of onset of injury and for years of experience playing stand-up basketball.

As is the custom, the skills test was broken down into T-scores for each athlete. The T-scores were divided into three categories: high, average, and low. The top 25% of athletes were categorized as a high skill level. The middle 50% of athletes were placed in the low skill level. Accordingly, the bottom 25% of the athletes were placed in the low skill level category. For this particular sample, these categories were classified as being high set at a value of 371.56 and higher; average scores ranging from 371.55 to 333.1 and low turned out to be scores that fell below 333.09 and lower (Table II).

For the purposes of this investigation, after a random sample had been selected, nine subjects fell in the high skill level category, six in the average skill level, and nine in the low skill level category.

An overall profile of the twenty-four athletes selected for this investigation are presented on Table III. The table identifies the athletes by jersey number, their T-scores, skill level, and ranking order.

Evaluator Characteristics

The evaluators were a key element to this study. Two groups of reviewers were used to judge skill levels of the wheelchair basketball participants. These groups were designated as groups of novices and experts. A total of seven experts and twelve novices responded to the evaluation form used in the investigation.

The experts' were identified by criteria which included:

- Played the game for at least ten years and up to thirty years
- Played in the national and international games such as the Gold Cup and Pam-Am games
- Coaches and players of the Paralympic Wheelchair Basketball Team
- Coached for a minimum of 2 years and up to twenty years
- Represented Member of the USA Basketball Committee.

Experience of novices included:

- No coaching experience of any kind
- Common knowledge of basketball from playing the stand up counterpart
- Have watched wheelchair basketball games before
- Some had prior experience playing wheelchair basketball

Evaluation Results

A summary of the experts responses can be found on Table IV. This table provides the raw data which represent the number of experts that ranked a specific athlete in a particular skill level. The percentages of experts that ranked a specific athlete in a skill level are provided as well. The values that are bolded designate agreement of the experts with the skills test in the categories of the high, average, and low. Similarly, novices responses can be found in Table V.

Skills Test Reliability and Results

The individual test items were subjected to correlation and reliability tests (Hull & Nie, 1981). The overall reliability coefficient for the seven skill elements tested in the skills test was .7427 as identified by SPSS Reliability analysis. This indicates that the

instrument used in this investigation can be considered an internally consistent indicator of the participants' overall skill proficiency.

Ranking Results

The ranking results were recorded on an evaluation sheet that was developed by the researcher based upon a study by Rowe in 1994. These rankings were completed by the two evaluating groups observing the athletes in a competitive scrimmage during the first two evenings of camp. The experts agreed with the PVA/NWBA skills test on 17 out of 24 athletes, which is 70.83% agreement with the skills test categories. The novices agreed with the test categories on 17 out of 23 athletes. One athlete's ranking was split 50/50 on two different categories. Novices had 73.91% agreement with the skills test categories results.

Additional Reliability Information

One of the purposes of the skills test given at the PVA/NWBA is to use the data to divide the participants into equally competitive teams not only for instructional purposes but also for evening and tournament competitions. The competition results support the skills test capability to accurately place athletes on equally competitive teams. Results from the evening competition indicate going into the tournament the Rockers team had the best record and were the favorites to win the tournament. The results of the tournament also indicate that competitions were at a level where each team had a legitimate chance to win.

The win/loss records of each team for the evening camp competition can observed in table VI. These standings were used to set up the teams for the tournament played on the last evening of camp. The competition was set up in a simple tournament with

consolation. The eight teams were seeded in relation to their record during the evening camp competition. The outcome of the tournament can be found on table VII to make the comparison between how the teams did during the week scrimmages compared to the outcome of the tournament played on the last evening of camp. First place in the tournament went to the Starz who were in second place prior to the tournament. Second place went to Mercury who had the fifth best record before the tournament. Third place went to the Sparks, they were previously third in the team standings. Fourth place in the tournament was the Rockers who were in first place and were the favorites to win the tournament because they had the best team standings to that point. Fifth place went to the Monarchs. They were in seventh in team standings. The Comets reduced to sixth place in the tournament, lowering from a team standing of fourth. Sting took seventh place, rising from eighth place. Finally, Liberty went down to eighth place in the tournament, they had held the sixth team standing going into the tournament.

The Mercury showed the most significant change between the week record standing of 5th place to the tournament standing of 2nd place. It is also important to note that the Rockers moved from the favorites of the tournament coming in with the best week record and ending up in 4th place in the tournament.

Summary

The skills test has been evaluated in three ways, by the experts, novices, and by comparing the win/loss records of the week and the final tournament. Both the expert and novice evaluators had a 70% and greater agreement with the results of the skills test. The high agreement percentage of the evaluators compared to the skills test provides additional support to the skills test as an assessment for athletes skill level in wheelchair

basketball. The tournament results and the win/loss records of the evening scrimmages supports the skills test as a functional tool when used to divide teams up into competitively matched groups. The results of this investigation firmly support the benefits of using the NWBA/PVA skills test as a beneficial test battery.

Table I

Demographic Data: Comparing Mean Scores

Mean Score Description	Mean Score of 90 Athletes	Mean Score of 24 Athletes
Age of Athletes	30	29.71
Hours of Practice/Week	6.79	7.2
Age of Onset of Injury	17.89	15.79
Wheelchair BB -Yrs	4.69	5.13
Stand-Up BB -Yrs	3.33	2.75

Table II

Athletes Identified by Jersey Number and the Category They were Placed in

Skill Level Category	Athlete's Jersey Numbers
High	80,105, 99, 20, 45, 79, 117, 91, 30
Average	33, 104, 56, 116, 47, 34
Low	111, 23, 44, 112, 59, 90, 24, 19, 103

Table III

Athletes Identified by T-Score, Skill Level, and Ranking Order Within the Study Group

Athlete's Jersey Number	T-Score	Skill Level	Team	Ranking Order
20	435	High	Sparks	1
45	430	High	Comets	2
79	425	High	Liberty	3
30	421	High	Monarchs	4
91	418	High	Monarchs	5
105	394	High	Rockers	6
99	393	High	Mercury	7
117	387	High	Monarchs	8
80	376	High	Sparks	9
34	358	Average	Sting	10
47	355	Average	Sting	11
56	352	Average	Liberty	12
33	349	Average	Rockers	13
104	349	Average	Mercury	13
116	337	Average	Sting	15
23	329	Low	Mercury	16
103	313	Low	Starz	17
59	288	Low	Comets	18
111	281	Low	Rockers	19
112	277	Low	Comets	20
44	277	Low	Sparks	20
90	267	Low	Liberty	22
19	252	Low	Starz	23
24	216	Low	Starz	24

Table IV

Experts Tallied Skill Level Ranking Results & Percentages

		HIGH		*AVERAGE*		*LOW*	
Athletes Jersey Numbers	*Skill Level*	*Raw Data*	*%*	*Raw Data*	*%*	*Raw Data*	*%*
111	Low					**7**	**100%**
33	Average	1	14%	**5**	**71%**	1	14%
105	High	**5**	**71%**	2	29%		
23	Low			3	43%	**4**	**57%**
99	High	3	43%	4	57%		
104	Average			**6**	**86%**	1	14%
20	High	**5**	**71%**	2	29%		
80	High	1	14%	5	71%	1	14%
44	Low					**7**	**100%**
45	High	**6**	**86%**	1	14%		
112	Low					**7**	**100%**
59	Low			2	29%	**5**	**71%**
90	Low			2	29%	**5**	**71%**
56	Average			3	43%	4	57%
79	High	**4**	**57%**	3	43%		
117	High	3	43%	4	57%		
91	High	2	29%	5	71%		
30	High	**5**	**71%**	2	29%		
116	Average			2	29%	5	71%
47	Average			**6**	**86%**	1	14%
34	Average	3	43%	2	29%	2	29%
24	Low					**7**	**100%**
19	Low			1	14%	**6**	**86%**
103	Low			1	14%	**6**	**86%**

17/24 = 70.83% accuracy with the PVA/NWBA wheelchair basketball skills test results

*Figures in **Bold** indicate the category in agreement with the PVA/NWBA wheelchair basketball skills test

Table V

Novice Tallied Skill Level Ranking Results & Percentages

		HIGH		*AVERAGE*		*LOW*	
Athletes Jersey Numbers	*Skill Level*	*Raw Data*	*%*	*Raw Data*	*%*	*Raw Data*	*%*
111	Low	2	17%	3	25%	**7**	**58%**
33	Average	2	17%	**10**	**83%**		
105	High	**6**	**50%**	5	42%	1	8%
23	Low	3	25%	4	33%	**5**	**42%**
99	High	**8**	**67%**	4	33%		
104	Average	4	33%	**8**	**67%**		
20	High	**9**	**75%**	2	17%	1	8%
80	High	2	17%	10	83%		
44	Low			10	83%	2	17%
45	High	**12**	**100%**				
112	Low	1	8%	9	75%	2	17%
59	Low	2	17%	9	75%	1	8%
90	Low			4	33%	**8**	**67%**
56	Average	3	25%	**8**	**67%**	1	8%
79	High	**9**	**75%**	3	25%		
117	High	**10**	**83%**	2	17%		
91	High	**9**	**75%**	3	25%		
30	High	**9**	**75%**	3	25%		
116	Average	4	33%	**7**	**58%**	1	8%
47	Average	5	42%	**7**	**58%**		
34	Average	6	50%	6	50%		
24	Low	1	8%	8	67%	3	25%
19	Low			**12**	**100%**		
103	Low	2	17%	6	50%	4	33%

17/23 = 73.91% accuracy with the PVA/NWBA wheelchair basketball skills test results

*Figures in **Bold** indicate the category in agreement with the PVA/NWBA wheelchair basketball skills test

Athlete #34 should be noted as split 50% in both the high and average categories

Table VI

Team Standings Recorded from the Evenings of Scrimmages

Team Names	Records
Rockers	11-4
Starz	10-5
Sparks	7-8
Comets	7-8
Mercury	7-7-1
Liberty	6-9
Monarchs	6-9
Sting	5-9-1

Table VII

Final Day Tournament Results

Placement	Teams	Records
1st	Starz	10-5
2nd	Mercury	7-7-1
3rd	Sparks	7-8
4th	Rockers	11-4
5th	Monarchs	6-9
6th	Comets	7-8
7th	Sting	5-9-1
8th	Liberty	6-9

CHAPTER IV
DISCUSSION

This chapter covers a summary of the research and general conclusions that were derived from this study. This section also focuses on the limitations of the study, the implications as they relate to skills testing for individuals participating in wheelchair basketball, factors related to improving the study, and future research.

Summary of the Research

The purpose of this study was to determine if the results acquired from the PVA/NWBA Wheelchair Basketball Skills Test compare to the skill ranking of the panel of observers.

As a result of this study it is evident that 1) the PVA/NWBA skills test compares favorably to the observational evaluators to be an adequate measurement tool that can identify global wheelchair basketball proficiency levels, and 2) the skills test appears to be successful in placing athletes in equally competitive teams for instruction and competition. These conclusions have been drawn from an examination of the research results which were:

1. The observations of the evaluators were comparable with the individual PVA/NWBA Wheelchair Basketball Skills Test results.
2. The teams placement process for competition while at camp were found to be appropriate for assuring equality in competition.

Discussion

When all of the scores from the skills test battery are combined to develop a total profile of the individual, it would then be hoped that it would represent a profile that

would provide a statistically reliable judgment of the individuals overall skill level in the sport. Yet this has not been tested related to the PVA/NWBA instrument to date. Thus, results of this study do indicate that there is a high level of agreement between the observing evaluators and the PVA/NWBA skills test.

The sample of the study and the extent to which the results can be generalized deserves discussion. First, the group of athletes represented males from the U.S. and the international community and were diverse in age. There was equal opportunity to participate in this camp as it is open to any physically disabled participant. Any one of the athletes present at the 1997 PVA/NWBA camp could have been part of this study because the subjects were randomly chosen. Because of this, results acquired from this study appear to be applicable to the average male wheelchair basketball participant.

The question might arise, "If people off the street can evaluate athletes accurately, why administer a skills test that takes time to administer and assemble experts that cost more time, energy, and money?"

Pure observation of skill level in a sport is also another way to justify coaching intervention on team placement. When used hand in hand, both of these methods add a better picture of overall reliability in judgment. This study thus indicates that the PVA/NWBA skills test battery is a valuable and appropriate tool for judging global skill level when compared to observation. It also indicates that novice observers may tend to give the average skill level participant a higher judgment and expert observers may tend to give athletes a lower judgment. When it comes down to evaluating high and low skill levels, however, the experts and novices appear to be equal in their judgments. Thus, the

skills test may be better at making the distinction between the areas of moderate level skill, which becomes very beneficial for instruction and team placement.

Rationale for the use of a skills test battery might include:

- To provide more personal information on specific skills needed to participate in competitive sports
- Provide individual evaluations for each area of skill deemed necessary to be a complete player
- The feedback is vitally important to the coaches to assist them in directing the athletes on skills which need more practice
- Accumulates valuable data that aids the coaches to enhance the skill development of the athlete and competitiveness of the game which in turn amplifies spectators enjoyment

Lastly, the validity of the use of the results of the skills test to place participants in teams of equal or comparable skill level appears to be worthy of further comment. From reviewing the data from the 1997 PVA/NWBA camp it can be observed that the records from the evening competition indicates a moderate to high level of equality when looking at these records. This can be even further evaluated when looking at the final day championship. A simple elimination tournament with consolation competition for which teams were seeded in relation to their record during the evening camp competition was held. Results from this tournament indicates that in fact most teams had an equal chance of winning the tournament.

In conclusion, the skills test used at this annual camp appears to be accomplishing what it attempts to accomplish: The determination of the appropriate wheelchair basketball skill level of the participant and the use of the results to assure fair and equitable competition at the camp. Yet there are also implications for future research in this area that need to be addressed.

Implications for Future Research

Future research efforts should focus on developing a study that is designed to focus on the individual skill elements of basketball rather than concentrating on the global view of the athletes skill level. This could be done by having the observational evaluators concentrate on judging the athletes on one skill component such as controlling the ball or shooting technique. Additional research focusing on individual skill in the heat of competition would be valuable including such elements as ability to catch a pass while moving, or shoot while being guarded. Looking at the current test battery to find if it could be more economical and efficient by using only those items that tend to better discriminate specific differences in skill. For example, it may be only necessary to test non-dominate skills rather than using both dominate and non-dominate skills. Additional considerations might be the expansion of the inquiry into areas such as specific levels of disability versus skill levels, and adding norms for women and youth as subgroups.

Limitations

Limitations are uncontrollable events that may interfere with the results of the study. The evaluation form may be a limitation because it was the first evaluation form the researcher had ever developed and it may have been confusing to the people using the form to record their data. The sample for the investigation may not have been a true

representation of wheelchair basketball athletes. The allotted time for observation that the experts had was hard to monitor. The experts had viewed some of the athletes during the day session of the camp so they had more experience to base their decision on than the novices. The novices had not viewed the athletes prior to taking part in the study during the evening scrimmage sessions. The observed evaluation was also expressed as being difficult to judge skill level by the novices because they had no previous experience observing athletes for the purpose of ranking their skill level.

The novices ranked the athletes at a higher level of agreement with the NWBA/PVA skills test than the experts. The novices may have had a higher percentage of accuracy in ranking the athletes because they have less variables to consider when making a judgment. The experts have more experience assessing athletes by observation through their years of coaching. The experts may have been apprehensive to rank an athlete as high in skill level after only viewing them for one scrimmage.

Some potentially extraneous variables may include: variation in subjects' cardiorespiratory fitness, previous experience in the sport, errors in gathering data, and motivation. There is always potential for error in gathering data in a study. Lastly, the motivation of the evaluators does have an effect on their recorded data which can effect the investigations outcome.

Summary

Through this study the PVA/NWBA Wheelchair Basketball Skills Test compares favorably to the observational evaluations and as such adds to the argument that this test may be a reliable measure of the global skill levels of wheelchair basketball participants. The statistical reliability coefficients for the particular test were determined as .7427.

The test is valuable for instructional placement and competition purposes. Most competitive sports have some type of evaluation instrument that is used by coaches to assist them in focusing instruction, and many coaches presently use the skills test to evaluate their athletes. It is important to continue to strengthen the competitive aspect of wheelchair basketball for the athletes, coaches, leagues, and spectators, and the PVA/NWBA Wheelchair Basketball Skills Test will aid in this endeavor.

The information acquired from this investigation appears to answer some of the concerns that have been expressed from other researchers over the years such as Vanlerberghe, Spaepen, and Lysens (1995) and Brasile and Hedrick's (1986) studies. They focus on placing value on results from a battery of skills tests and comparing the results to competitive situations. As a result of this investigation, the NWBA/PVA skills test, the measurement of wheelchair basketball skills, and the results of the test battery when predicting skill level appear to coincide with the athletes observed competitive skill level. The investigation is a worthy comparison when there is no adequate standard or like test battery to compare the test to.

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APPENDIX A

WHEELCHAIR BASKETBALL SKILLS TEST SCORE CARD

Wheelchair Basketball Skills Test Score Card

IDNO _____ Name _____

Age _____ Years of Experience _____ Hours of Practice Per Week _____

Age of Onset of Disability _____ Pre-Disability Years of Experience _____

Circle the correct response:

Is your Disability: Congenital Acquired Your NWBA Class: I II III

To what extent is participation in wheelchair basketball important to you?

1	2	3	4	5
Bottom 10%	Below Average	Average	Above Average	Top 10%

Compared to others involved in wheelchair basketball, how would you rate your level of competence in this sport?

1	2	3	4	5
Bottom 10%	Below Average	Average	Above Average	Top 10%

20 Meter Sprint	MinShot (D)	MinShot (ND)	AccPass (D)	AccPass (ND)	Spot Shot	Obstacle Dribble

APPENDIX B

EVALUATION FORM

EVALUATION FORM

Your documented ranking will represent the athletes overall skill and ability level in wheelchair basketball. Please rank each individual on this form by marking one of the three skill level categories as you first observe the athletes during the sessions. You are asked not to interact with other individuals who are acting as observers for this study. If you have any questions during this evaluation please ask me at any time.

	High	**Average**	**Low**
Rockers Team			
#111	_____	_____	_____
#33	_____	_____	_____
#105	_____	_____	_____
Mercury Team			
#23	_____	_____	_____
#99	_____	_____	_____
#104	_____	_____	_____
Sparks Team			
#20	_____	_____	_____
#80	_____	_____	_____
#44	_____	_____	_____
Comets Team			
#45	_____	_____	_____
#112	_____	_____	_____
#59	_____	_____	_____

	High	**Average**	**Low**
Liberty Team			
#90			
#56			
#79			
Monarchs Team			
#117			
#91			
#30			
Sting Team			
#116			
#47			
#34			
Starz Team			
#24			
#19			
# 103			